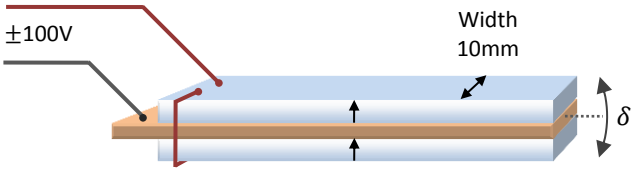
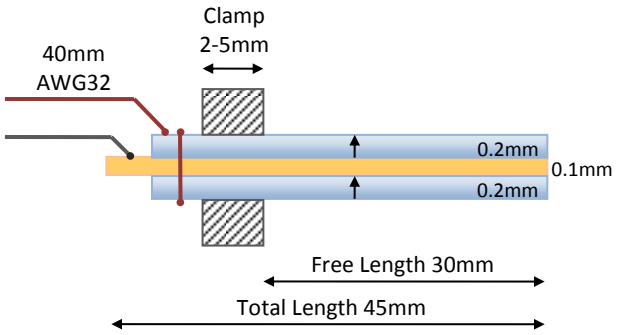
PiezoDrive

±100 V Piezoelectric Bimorph Bender

The BA4510 is a piezoelectric bimorph actuator poled in the parallel configuration with a two-wire electrical connection as illustrated below. In addition to actuation, this configuration is also useful for sensing and vibration power harvesting.





Mounting Considerations

Bimorph actuators can be mounted using an insulated clamp or bonded to a base with a two-part epoxy such as Araldite.

Electrical Current Requirements

The required current is $I = C\ dV/dt$, where I is the current, C is the effective capacitance, and dV/dt is the voltage rate-of-change. For a sine-wave, the required peak current is equal to:

$$I_p = \pi C f V_{p-p}$$

where V_{p-p} is the peak-to-peak voltage. For a triangle wave, the required peak current is

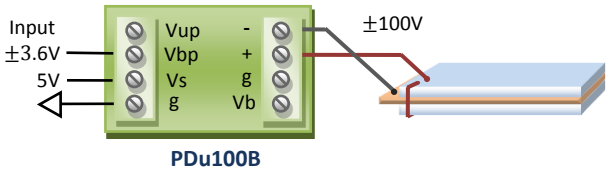
$$I_p = 2 C f V_{p-p}$$

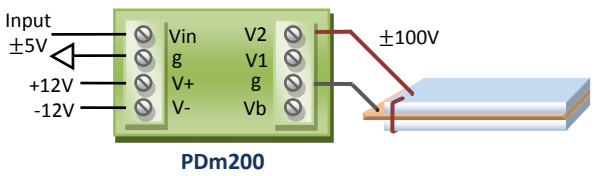
Specifications	BA4510
Deflection	±1 mm
Input Voltage	±100 V
Blocking Force	0.2 N
Small Signal Cap.	65 nF
Stiffness	200 N/m
Resonance Freq	170 Hz
Total Length	45 mm
Free Length	30 mm
Width	10 mm
Thickness	0.5 mm
Piezo Thickness	0.2 mm
Mass	1.61g

Recommended Drivers

The recommend drivers and associated power bandwidth (±100V Sine-wave) are listed below

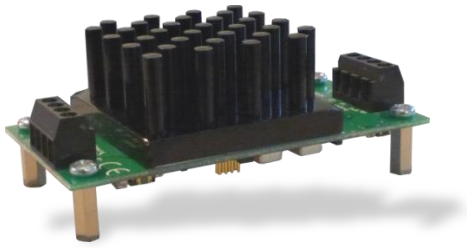
Amplifier	Applications	Power BW
PDu100B	General purpose	184 Hz
PDu100	Miniature	184 Hz
PDm200	High performance	1700 Hz





Recommended Drivers (Actual Size)

PDu100B



PDm200

Range

The range is specified for an applied voltage of $\pm$100V. When the actuator is driving a spring, the range is reduced by the factor

$$\frac{k_p}{k_p + k_L}$$

where k_p is the actuator stiffness and k_L is the load stiffness.

Options / OEM Customization

- Custom range and dimensions
- Custom wiring arrangement / connectors

Contact and Support

info@piezodrive.com

Piezoelectric Properties

The piezoelectric material is similar to PZT-5H and Navy Type VI. The material properties are listed below.

Other properties of interest can be found in "TP-226 Properties of Piezoelectricity Ceramics" by Morgan Electro-Ceramics.

Property	Symbol	Value	Unit
Piezoelectric constants	d_{33}	600	10^{-12}m/V
	d_{31}	-270	10^{-12}m/V
	g_{33}	19.4	10^{-3}Vm/N
	g_{31}	-9.2	10^{-3}Vm/N
Electro-mechanical coupling coefficients	K_p	0.65	NA
	K_t	0.37	NA
	K_{31}	0.38	NA
Frequency constant	N_p	1980	Hz·m
	N_t	1950	Hz·m
	N_{31}	1450	Hz·m
Elastic constant	Y_{33}	5.3	10^{10} N/m^2
	Y_{11}	7.2	10^{10} N/m^2
Q Factor	Q_m	80	NA
Dielectric constant	$\frac{\epsilon_{33}^T}{\epsilon_0}$	3500	@1kHz
Dissipation factor	$\tan\delta$	2.5	% @1kHz
Curie Temp.	T_c	220	°C
Density	ρ	7.8	g/cm^3